

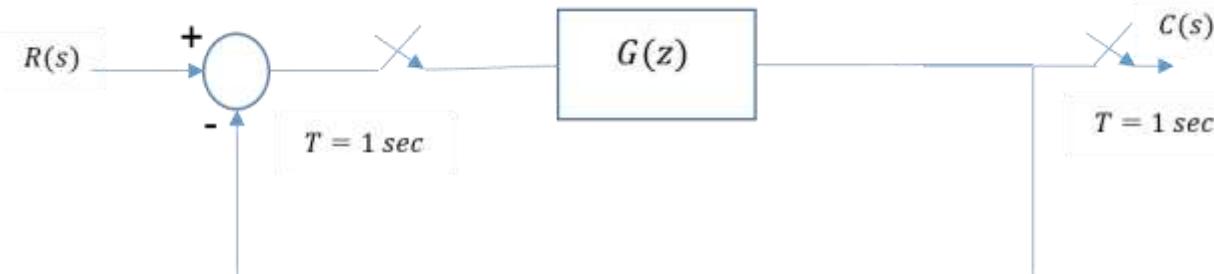
Sheet 4

1. Check if the roots of the following characteristic equations lie within the unit circle:

- a) $5z^2 - 2z + 3 = 0$
- b) $z^3 - 0.2z^2 - 0.25z + 0.05 = 0$
- c) $z^4 - 1.7z^3 + 1.04z^2 - 0.268z + 0.024 = 0$
- d) $z^3 + 5z^2 + 3z + 2 = 0$

2. For the system shown in figure below with discrete gain

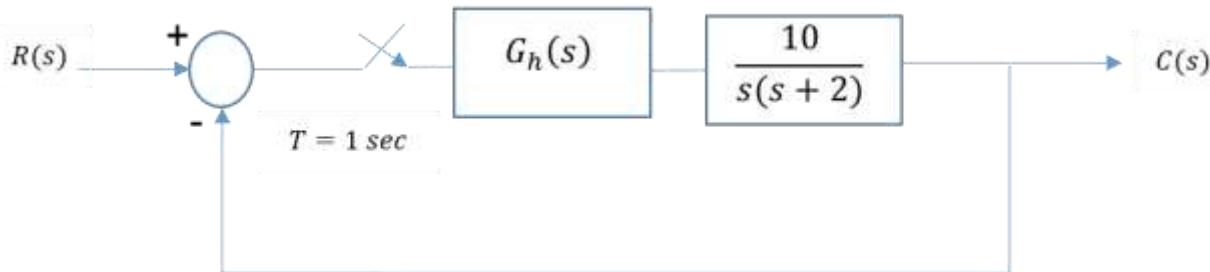
$$G(z) = \frac{0.1(z + 0.9)}{(z - 1)(z - 0.7)}$$



Check the system stability using:

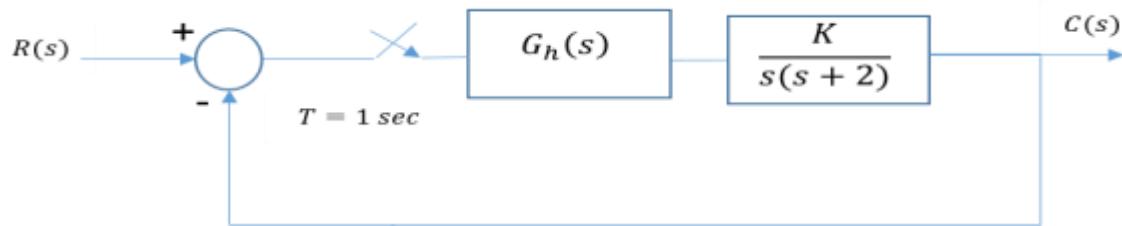
- a) bilinear transformation
- b) Jury test

3. Write the system characteristic equation, check the system stability

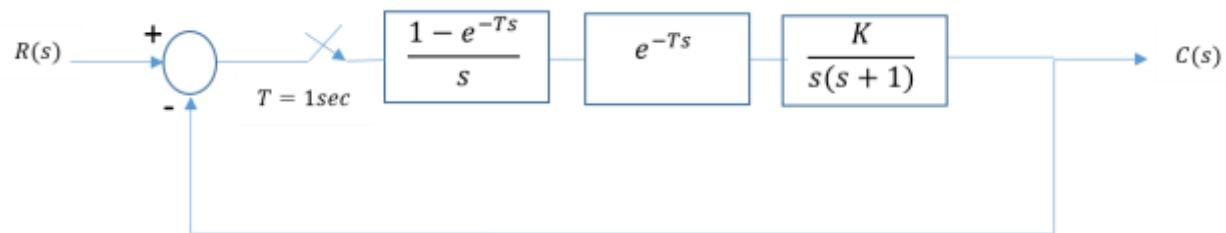


4. For the following system, determine the range of K for stability

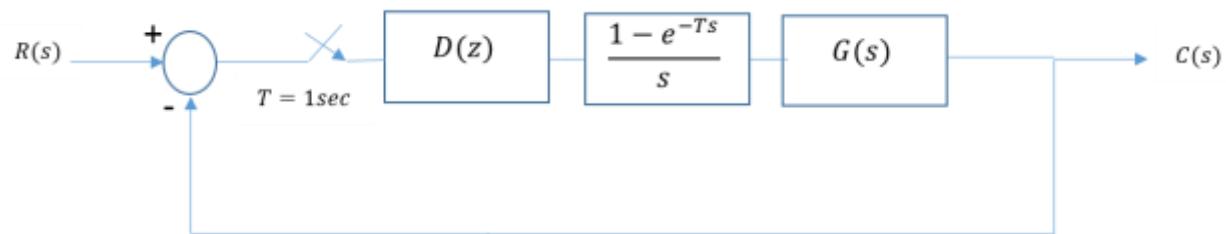
a)



b)



c)



$$D(z) = K \quad \& \quad G(s) = \frac{0.5}{s(s + 0.5)}$$

5. For the following system characteristic equations using: bilinear transformation and Jury test.

- a) $F(z) = z^3 + 5z^2 + 3z + 2$
- b) $F(z) = z^3 - 1.3z^2 - 0.08z + 0.24$
- c) $F(z) = z^3 - 1.8z^2 + 1.05z - 0.2$
- d) $F(z) = z^4 - z^3 + 1.8z^2 + z - 0.4$